EXPLORATIONS
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THE CINEMA OF THE FUTURE

I. TECHNIQUES: FROM THE POINTING FINGER TO THE "3D" SCREEN

A lot of discussion has gone into the subject of whether the spoken or written language began first, and it seems to be generally decided in favour of the former. It is conceded that different grunts were allotted to different things. But how were they allotted? I should like to suggest that it was often by the pointing finger. This, to my way of thinking is a method of drawing, of making pictures.

For example to arrive at the concept "tall", a savage may have pointed at a tall tree and then at the tallest member of his tribe, and made a sound. On first noticing the strange behaviour of their friend, two pictures must have been in the rest of the tribe's mind; the real picture of their "excited and pointing friend" and another one, created by their own mental energy, that of their "friend when normal". To find the cause for this difference they must have followed his pointing finger and taken in the pictures of "the tree above others" and "the savage above others".

In this sense, though I by no means know if this is really the way language began, the written language preceded the spoken, and indeed produced it. Then

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The original article is much longer, but because of space limitations we have had to omit the author's description of the effects of the hallucinatory mushrooms of the Mazateca, and also his rough sketch for the scenario.

in a later and separate process man re-drew the sounds he had made with scant reference to their pictorial origins.

In fact man soon gave up pointing at real pictures because to construct each and every concept this way would have involved his listeners in an endlessly protracted guided tour. But whether he next knotted strings together as did the Aztecs, or copied imprints from the mud in the estuaries where man first set up camp I don't know, and for that matter it seems to me to be irrelevant; he grabbed what he could, string, stone, bone or mud.

After much time paper and ink became the accepted medium of writing. As old metaphors became cliches new ones had to be invented. And as visual reality was and remains the main reality continuum of mankind, the great writers still tried to make their readers see. From their symbols people created their own pictures, and probably none of them were exactly the same.

The fact that none of these pictures were the same leads to an interesting comparison which will be here interposed, as later it will be extremely relevant to this article. When several persons who had suffered hallucinations caused by the chemical "Psylocybin" were asked if they had seen exactly the same hallucinations, they replied that they had not. This disappointed their interrogators, because it seemed to prove that such hallucinations were in no sense insights, but merely subjective projections.

Firstly to dispose of one aspect of this question quickly, no two people can ever see exactly the same thing, because they occupy different positions in space. In most cases the differences are considered irrelevant because they have no dire consequences in the everyday business of survival. However, to dispute whether a traffic light is red or green is more serious because they mean different things. Such differences are arbitrary value judgments made on the stuff of the universe by mankind in order that men might survive.

When for example two friends read the same book, each single visual construction each makes from the print may differ in every case, but these differences don't matter, in fact they are essential if each person is to feel the same thing. In what sense then, when they put the book down, have they experienced the same thing? Only in feeling. Similarly in reading the stuff of the universe while under "Psylocybin", the different pictures don't matter, in fact they are essential if the participants are to experience the same thing. Before one can criticise the participants' opinions about their experiences one must at least read their book.

Thus to return to writing, the symbols of a printed page only become real if read in a special way. In Western poetry the sense of the symbol combines in an intenser way with its sound in order to give the reader a heightened sense of reality. Later in Western opera it was the sound which dominated the visual, and in the case of Wagner, who had the visual imagination of a nouveau riche, the visual did not add stature to the sound. Artists soon began searching for new forms of expression, new languages, but one of the languages they failed to find was Cinema, man's first language.

Only Chinese writing preserved even traces of the cinematic form. For example the verb "to weep" remained the combination of the character for "eye" with the character for "water". But it was not until 1965 when Satyajit Ray's "World of Apu" appeared on the screen that this very construction was advanced a further stage.

An old woman sits motionless beside the empty crib where her grandson has just died. The camera watches as if spying on her. Suddenly she lets out an immense sigh. Immediately there is cut in a huge wave which takes up the end of her sigh and smashes it down on the beach.

As it rushes up the sand in great expanding parabolas of foam the camera draws back and we see her son walking along the deserted shore. His face is set and white.

Here then a grandmother's sigh, plus a wave's crash, plus her son's white face, equals the anguish of grief.

Between the hieroglyphics of the legendary T'sang Chieh mentioned before and the above montage there lies over two thousand years but no fundamental change in what is meant by the cinema form.

When the movie camera was invented the lens was established as a picture indicator. But the lens didn't merely indicate, it captured the picture and took it away with it. Yes, the lens and bromides could have performed the vital function of inventing a new language, but all the early directors allowed it to say was "a tree is a tree is a tree" and gave its gaping audience the astoundingly dull message that a tree moves.

This machine became a slave to the reality continuum, and even when provided with a sound recording device it still refused to re-combine its units in a new way. Thus every adhesion of sound to a picture only increased its inertia as a unit in a new language, and so all the constructions which came forth from the early movie camera, instead of rising up on the wings of a new art, merely fell back into the reality continuum like fish returning to water.

The early directors of this potentially new language, to change the image, latched sound to the visual continuum just like a horse to a cart, and like cab drivers they sat on top and drove this combination through every damned plot and melodrama that had ever been invented, almost as if they were on a road with never an end in view. And as long as this fantastic contraption paid its way, they were.

But this process of sticking pictures to dramatists' and novelists' words produced not too surprisingly not a single genius. However, genius did flourish for a time on the silent screen. But when sound began to pay its way these geniuses were abandoned, and the search for ever more "techniques-which-paid" was on.

The telephoto lens produced startling results. Reporters could report without sticking their cameras in people's faces. But whether the telephoto lens or Griffiths himself invented the close-up, seems to me to be one of those irrelevancies which gather popular support, like Columbus' discovery of America, and depend for their validity on the pre-condition of ignorance. To me the close-up is almost as old as art itself. Why did the Greeks wear masks in their drama? Why does Marcel Marceau paint his face white, and outline only his eyes, nose and mouth? Emotions become larger than life, laughter becomes more real, and sadness more pathetic or tragic. The taking off and putting on of masks was also used, both to reveal how much of life goes on behind masks of some sort or other, and to provoke fear, which emotion the Greeks realized was the essence of effective drama. How masterful was this ancient invention of both Eastern and Western theatre, and the silent theatre, the Mime.

But to show how ignorant of its aesthetic force these early cameramen were, I need only quote Eisenstein. "A leading cameraman from Fox said that although they could not approach the subject close enough to secure a close-up, it was no drawback for the image on the screen was so large that the character's expression could more or less be clearly discerned even in mid shot. Despite the presence of a multitude of directors and leading technicians from every studio, this astounding appraisal excited no remark".

To avoid having to keep changing lenses the revolving turret was next invented. However the camera still had to be moved backwards and forwards in order that the director could frame the shots to his satisfaction. To do away with this time consuming procedure the zoom lens was invented. Such fun was the zoom effect that due to all too frequent use of it without incorporating into it a correct parallax effect, the gimmick was all too soon exhausted. But were the subtler aesthetic qualities of this lens ever exploited? As ever the aesthetic principles of this lens were never more than half grasped, and never fully analysed. The economic aspects were fully exploited, and when exhausted, those concerned with such things began to look around for other gimmicks which might sell, and so the process continued.

The members of the so-called "Academy of Motion Picture Arts and Sciences" having proved themselves entirely ignorant of Greek drama, now began to spend their energy in destroying other emotional languages men had spent much toil and care to produce. Witness this example from the Bolshoi. The dying swan was being danced. At stage centre the trembling figure descended from movement to movement in the languor of death, yet at the same moment conveyed the spirit of something vibrant and young. The mind finds no words to describe this scene, it remains essentially communicable only in its own medium. But the director knew better, and like a half blind person trying to discover the secret of a mosaic with a microscope, he went closer.

Every illusion Ballet had striven to create was instantly destroyed. One suddenly saw Ulanova the dancer, hideously painted, an old woman straining marvellously, wriggling in an ecstatic nightmare of exaggerated mime.

A subtler evaluation of the zoom might have revealed its suitability for revealing certain mental processes. For example a young man is daydreaming about taking out a girl. He shows her to a car. As he is not consciously thinking of the car it is probably a wishfulfilment; sufficiently vague to preclude any thoughts as to whether he could afford such a car, sufficiently concrete to be real. A moment later it is dispensed with, he is whooping it up at some party or other. Are not many daydream sequences just this, rapid fire zoom effects, which come on the screen, fill it a moment, then pass outside the frame?

The zoom remained, however, because it was mainly used as a sort of obliging coolie who could, at the mere twist of a thumb, transport the frame limits to and fro, immense distances, with great precision and rarely a false step.

Next in the list of inventions came the wide screen. As mentioned earlier, a prominent cameraman from Fox stated that this did away with the necessity of the close-up shot, but like the hypothetical man who invented "Six Up", he didn't know how near the mark he was. For after the wide screen came the panoramic screen with three dimensional projection. And here something happened which was rather a shock to these people. They now found that the oft praised close-up had disastrous effects; the figures appeared to jump forward for no apparent reason!

Here an aesthetic principle had at last come into open conflict with a new technique. From that day Cinema as an art could no longer be aborted. Thrusting their hands for almost the last time into this womb of plenty, they brought forth for the public *How the West was Won* and *The Seven Wonders of the World*, significant only in the fact that they contain no close-ups in the aesthetic sense, and are thus pure spectacles, the lowest form of visual art.

To conclude then, in the evolutionary history of cinema as an art, Hollywood was a dead end. Its history was a progressive descent in aesthetic values from those exhibited in the silent screen to those exhibited by the spectacle. True we owe Hollywood's technicians a debt. But what exactly is this debt? Perhaps it is really no more than this, that "their high standard of technical perfection", or to use a more meaningful phrase "their idealistic, costly, and unvarying camera style" has so dulled the public taste that it has enabled the director with a visual imagination and not much money to be envied for doing no more than incorporating the botched shot, the out of focus shot, the slightly under- or over-exposed shot into the grammar of his film.

Now we must go back to the problem of language, the eternal efforts of man to express and communicate his feelings. Only when we have done this can we honestly say whether we will need these techniques, whether we will really need to go gaping into this market place with its dubious merchandise.

II. THE ART OF THE CINEMA

Language

Language consists of a message and a medium. When the message has achieved a meaning then the language itself becomes a reality continuum. Seeing is such a language and visual reality is one of the main reality continuums for mankind. Seeing is thus a language which has to be learnt like any other. The medium is certain wave lengths of light. The message these can produce rise in complexity as man learns how to see. Helmholtz states that when a child, on seeing a large statue far away on a church wall, asked if he could have "that doll". He had not yet learnt to consider the effect of distance on the size of an object.

Reality Continuums

A reality continuum is any language perceived by man, but it is only a reality continuum for as long as it is being perceived, sensed, or understood. The reality continuum in which any individual exists as momentarily suiting him best can be called the ego continuum. The flux of unorganised continuums out of which all present and future languages are, or will be born, can be called the egoless flux of continuums or Taoist reality.

Primary Languages

Every organism chooses that continuum in which it can survive best as its main reality continuum, and the languages which operate in these continuums might be called primary languages. For example, when a dog hears another dog bark on television it sometimes goes to the screen and sniffs, but smelling no odour of dog, it soon loses interests in the antics of the screen dog. For a blind man the primary languages are aural and tactile. The fact that seeing is often believing makes one feel that visual reality is special, but it is only special because man needs it to be. There could be other intelligent organisms in the universe who find visual reality as obscure and intermittent as we find odours. They might dream in odour objects with their nostrils closed, and their sense of reality at any one time could contain such a vivid presence of the past as to be unbelievable to us.

This vivid presence of the past is easily understandable only in our own main reality continuum. For example, how easily we say, "Look, how beautiful the stars are tonight". We don't need to say, "Look at that one ten million light years ago, or that one which no longer exists". They are irrelevancies before the "reality" of the moment.

Reality and Man

Man can only have two final attitudes to reality. One is to accept it, which means to accept death, the other is to try to dominate it. And it is for this latter action that the visual reality continuum is called into being. But we will see that the camera in the hands of an artist need not be used solely for such a purpose.

Secondary Languages

Secondary languages arise out of primary languages and also create their own reality continuum. For example, a savage by pointing to a tall tree, then to a tall savage, and then making a sound, might have conveyed the concept "tallness" to his friends. In this way we may have arisen conceptual thought, a new reality continuum of concepts and ideas.

Newton on seeing the apple fall saw it not simply as a visual construction but as a law operating in Physics, as something performing a function in the physical continuum. This imaginative jump bestowed the identity of genius upon him. Continuums therefore are not distinct from the unities which exist in them, but each literally bestows existence and significance on the other. The evolution of reality continuums is thus a parallel process to the evolution of organisms.

For example, to discover if intelligent beings can be communicated with far out in space, a new language would have to be invented. In fact a logical numerical progression of dots and dashes has been beamed out to various parts of the universe on the wave length of hydrogen in the hopes of creating an intelligence continuum, an intelligence link between different parts of the universe. In this new language, hydrogen is presumed to be a suitable space continuum or medium, and logic (the basic continuum of intelligence), the message. By these means it is hoped that the tapestry of reality will continue to be woven.

Man has not always been so cautiously forward looking as this. Just as the blind without light must look elsewhere for their reality continuums, man has frequently been forced by oppressive or depressing forces to create new continuums. As Nietzsche has so well pointed out, the early Christians suffering the oppression of Roman imperialism created a new continuum of spiritual values in opposition to it. This continuum was established by a personal act of faith and the gift of grace. Its greatest appeal was that it was eternal, and so retributive upon the present unjust reality.

However, most continuums have less to boast of, and the cross-over to them can frequently be made with less effort. For example, when one reads the phrase "an hour passes" an imaginative hour is constructed with no difficulty at all, if only because one hopes to be entertained thereby.

In the film *The Loneliness of the Long Distance Runner* there was a sequence which illustrates one of the most common changes of this sort. The hero goes on early morning runs to prepare himself for the big race. The energy, sweat, cloudy breath and smoothness of the runner combine beautifully with the crisp yet soft dawn landscape in the background. As he runs foreground and background combine into a poetic entity which is taken up by a jazz theme. One moment he is running over treeless downs, the next, or even superimposed on the former shot, we see him jumping over a gate. These illogical cuts, far from being merely acceptable, seem to be demanded by the art form. The music has captured and appropriated the picture's internal rhythms. Just as we normally choose to believe that the voices of actors actually come from the actors' mouths, now we choose to believe that the pictures are called forth by the music's emotional content and tempo.

A seagull dives to Wagner's surging theme, a lonely face turns in the wind, a huge wave rises up, a car drives sadly along a long deserted road, etc., etc. Little or no art is demanded for such clichéd sequences, for it is the music which is carrying the burden of reality. In other words the music has become the reality continuum.

Mendelssohn's Reality Continuum

Mendelssohn claimed that he put into music not things too vague to be put into words, but things too definite, things for which words were not definite enough. In "other words", to reveal the realities he had perceived, he had to create a reality continuum of sounds other than speech.

To exhibit such a preference for a particular language is something we all do unconsciously a thousand times a day. Consider the following example. A lonely girl in a foreign city asks two men the way to the park. The first man immediately slips into the conceptual continuum, and the park becomes the reality to be achieved. He thinks out and gives her careful and accurate directions and continues on his way.

The second man swings in the sensual continuum. The girl is the reality of the situation. The park becomes a rival to be dismissed. He moves it to the other side of town, he closes it down, all the time watching the girl's reactions, because she is now the reality continuum.

Secondary Languages and the Screen

How should this be shown on the screen? A director has a variety of choices, but one rule should guide him. Whichever reality continuum interests him most for the structuring of his drama, that alone should fill the screen when and as it becomes the reality continuum. Each change of continuum should be unannounced. Conventions like parentheses should only be used when there is a muddle about who is thinking what.

In the first man's case the directions to the park should be shown graphically exactly as they come to mind. Thus as he begins to think them out the girl's face fades out and the directions themselves fill the screen. In the second case the park should be shown (humorously perhaps) closing down and moving far away, while onto the screen comes the girl's smile, and to the changing patterns on her face the man's words should continue.

Fellini's brief cuts of Claudia Cardinale in the beginning of "8½" are not that at all, they are much more, they are images of beauty so brief as to be hardly realized. Yet in a sense they are less than that. . . . In fact to present Fellini's image in verbal form is to tell a lie about it, and one is reminded of why Mendelssohn created music. So too with Eisenstein's lion montage in *Potemkin*. It is far more than the sum of its parts. Its truth is its effect. To put this into words is merely to prolong it into metaphor without life.

Languages and Reality: The Ego Continuum and the Egoless Flux of all Continuums

Primary reality continuums are projections of the ego upon the stuff of the universe. But what is this stuff which reflects our identities in its make-up? What is this place through which we pass on single threads for fear of losing our way, jumping from time to time to other threads as soon as we think them more suitable? What is this tapestry of which we can hardly perceive more than a few single threads at any one time?

This brings us back to the subject of Psylocybin mentioned earlier. Psydelectics create out of the matter of reality quite new symbols, out of which the participants also create personal pictures. As we have said, that these pictures are not the same does not matter, the total effect of them is. During the experience the participants find that as the different layers of reality (the visual, the tactile, the aural, the emotional, etc.) are gently pared away, they themselves also begin to fall apart. In the end they cease to exist in the easy definition men have made for themselves, which they have always taken for granted.

After a time they do not know what to select as the reality continuum and give up. They remain viewing the resultant flux with profound humility and awe. Everything has been unlearnt, they are reduced to the state of infancy, with one important difference, they now see that all other languages are based on one thing alone, the survival of man. Yet they have lost contact so absolutely with other continuums that the loss of life would seem no more absolute. And they could accept it, and contemplate it, with passivity. This is the Taoist experience.

Consider this example from the battle of Austerlitz in *War and Peace*. Prince Andrei has been beaten to the ground while attempting to save the Russian guns from the French.

"After a time he opened his eyes hoping to see how the struggle of the French soldiers with the artilleryman was ending and whether the cannons had been taken or saved. But he saw nothing of all that. Above him there was nothing but the sky — the lofty sky, not clear, but still immeasurably lofty, with grey clouds creeping quietly over it. How quietly, peacefully and triumphantly, and not like us running, shouting and fighting, not like the Frenchman and artilleryman dragging the mop from one another with frightened and frantic faces, how differently are those clouds creeping over that lofty limitless sky. How was it I did not see that lofty sky before? And how unhappy I am to have found it at last. Yes! All is vanity, all is cheat save that".

Here Tolstoy keeps to the same reality continuum, the visual, but by taking two incidents poles apart in symbolic meaning, the battle and the sky, he confronts Prince Andrei with the two ultimate attitudes of man to reality.

Tolstoy was a master of this tension in art (where communication is all) but his final rejection of his wife's secure continuum of family and heritage and his wandering forth to preach and to die destroyed this tension in his own life. Gogol was wiser. He burnt his reformed Chichikov, for his artistic sensibility warned him that artists too have their own continuums beyond which it is better for them not to wander.

Antagonism between Ego Projections and the Egoless Flux of All Continuums

Psychologists are very aware of this problem, but consider that tension between ego dominance of any continuum, and egoless acceptance of the flux is necessary to create harmony in an individual life. Abraham A. Maslow, a noted psychologist, says that even when we deal with our relations to environment, we must make a theoretical place for a receptive relation to the environment as well as a masterful one. He considers the ego-view of reality "as clearly an unconscious expression of the Western outlook, because it involves a persistent and assiduous neglect of the writings of philosophers, theologians and psychologists of the Eastern world, particularly of the Chinese, Japanese and Hindus not to mention writers like Goldstein, Murphy, C. Buhler, Huxley, Sorokin, Angyal and many others".

"My findings indicate", he goes on to say, "that in the normal perceptions of self-actualizing people, perception can be relatively ego-transcending, self-forgetful, egoless. It can be unmotivated, impersonal, desireless, unselfish, not needing, detached. It can be object-centered. That is to say, the perceptual experience can be organised around the object as a centering point rather than based upon the ego".

From this we might say that a person in love finds in the loved object a new reality continuum. For two people in love each becomes the reality continuum for the other. Love, the emotion, is constantly created by the uniting of these two continuums. This synthesis of two continuums into an emotion is a true metaphor, and it is in this that language is initially conceived, and out of which art is consciously made. Thus every new language begins by synthesizing units of other languages into a new reality continuum. For example, the image of a tall savage plus the image of a tall tree, units of the visual continuum, combine to produce a concept "tallness", a unit in the conceptual continuum. This new idea is not the sum of its parts but the product, and differs not in degree but in dimension.

As Marshall McLuhan has pointed out, the urban youth of today are also synthesising units in the languages of mass media into a new reality continuum. It is an entirely new scene and they are making it.

Metaphor — Is the establishment of identity through and in differences.

This ego-egoless moment which is true metaphor, is a momentary breaking down of the hidden antagonism between the egoless flux and the ego projections of man. Such an event must be initially receptive, and the initial superimposition, haphazard, unreasoned and, in short egoless. The superimposition of two units, each so totally concerned with different realities, is remarkable. This achieving of a new identity by the momentary link between two continuums is a most precious moment in human values. For, as we have already said, not only are languages initially created by such links, but art also.

Primitive Music as Metaphor

It was through music that man first established an emotional identity with sound, and the metaphor he used was rhythm.

In the most primitive music the process is as follows. The body and the drum beat create their own time — for beat and rhythm are as much a creation of time by sound events as they are a creation of sound events by time. The mind standing equidistant so to speak between the music and the dancer's body perceives them to be as one. A profound yet simple metaphor!

The metaphor thus operates as a link between two different reality continuums, or any two units. When this link bestows upon the participants an emotional identity, the metaphor is born and art parades itself.

Cinematic Metaphors

Seeing is a process of reading the visual continuum to one's advantage, but man frequently oversteps the mark. Let us consider a simple cinematic metaphor to illustrate this. A man, waiting for a girl to appear from a distant doorway, may actually see her appear several times, only to change each time into something else; a young man in a raincoat, or even a drop of water on the window. Such metaphors could be shown on the screen by quick simple lap-dissolves. The metaphor in the latter case is that a desire, superimposed upon a drop of water, produces the desired object.

Let us now consider a personal example of the reverse case, where the ego makes a real event imaginary.

One night while on a military training exercise I had to go forward and mend a broken telephone cable. While thus engaged, there suddenly appeared before my eyes the crouched forms of three men. "Imagination" said my ego immediately, for to have accepted them in the reality continuum would have meant that I had already fallen into a very obvious trap. The image thus became a warning of a possibility, rather than an actuality. I finished the task. Suddenly three men sprang out of the darkness and grabbed me. I did not cry out even then, because I still refused to admit the fact that I could have fallen into so simple a trap. It couldn't happen, therefore it wasn't happening.

Cinema to be faithful in restoring emotional realities to its audience must present such significant realities in the continuums the characters it is portraying experience them.

Dead Metaphors

The moment when the continuum in which the new emotional unit is realized, the emotion attached to it fades back into the limitless night whence it must again be born, in another metaphor. The new unit becomes a symbol, a dead metaphor, and its value now depends on how well it can be used to convey messages in the new continuum. For example, Newton, though initially excited by the emotional impact of his falling apple, was only interested in it so far as it could express his idea of gravity as a general law in Physics.

Such syntheses immediately become the property of the mind which first perceived them, and such people, unless artists, adopt them as units in other continuums in which they have something important to say, and which will bestow upon them the significance they desire.

Art

Thus with all but artists such syntheses are valued in so far as they can be used to create more knowledge. But such knowledge will once more be used to structure reality as a medium for survival. Artists claim they have a more special type of knowledge to give, for even if man comes to defeat death, he will still have to find his condition worthwhile emotionally. Art is thus an attempt by man to restore reality to himself in a way which time and reason deprive him of.

To be independent of the continuums of time and reason, art constructs its effects in emotion. We have already said that a metaphor which can be completely analysed or used ceases to be art, so the greatest art constructs metaphors which incidentally allow of the highest analysis, both sensuous and intellectual. In the process of such analysis a tension is again set up, which is perhaps only a different organization of the original emotion.

As Eisenstein says, "the dialectic of a work of art is built upon a most curious unity. Its effectiveness is constructed upon the fact that there takes place in it a dual process, an impetuous progressive rise along the lines of the most explicit steps of consciousness and simultaneous penetration by means of the structure of the form into layers of profoundest sensual thinking. The polar separation of these two lines of flow create that remarkable tension of unity of form and content characteristic of true art works. Apart from this there are no true art works".

The Classic Metaphor

Eisenstein has noted how Shakespeare in one of his finest metaphors from *Julius Caesar* returned to an older language to achieve the desired effect.

As Caesar is struck down he turns and sees he is dying at the hand of his greatest friend. The metaphor of death fades instantly before this act of betrayal. It is a change into another reality and thus creates a new language. Shakespeare makes Caesar frame a question, perfect in its stuttering unbelief, and perfect in its subconscious undertone of brutality. He returns to Caesar's mother tongue.

But the horror of that moment, the mental truth, is more the property of Cinema than Latin or any other language, for Cinema is more languages than any art form has ever been, quite apart from being the mother tongue of man himself.

Tragic Metaphor

Cesare Pavese in his novel *The Harvesters*, creates a bucolic scene where labourers after work are waiting to drink from a pretty girl's water pail. The girl's younger sister Miliota is running over to join them. Their brother Taloni walks over too.

"A sudden ferocious glare blazed up in his eyes, he jumped back to give himself room, and before we knew it he had driven the pitchfork into her throat. In the sudden stillness I heard a great gasp from everyone there, then Miliota's voice calling out across the farmyard: 'Wait for me!' "

This eager call is a carry-over of a wrong reality. It presents us with an example of a tragic metaphor in the making. To understand its basic structure let us first take a very ordinary metaphor. A person frightened by the remark "The Boss is a raging lion this morning. Look out!" visualizes for a fraction of a second a picture of a raging lion superimposed on that of the Boss. The fear subsides as they realize that, whereas the boss is a reality likely to appear, the raging lion is not, as it is only a picture.

Pavese's metaphor is similar, but reversed, and its effect is tragic irony. He creates a happy scene, next a murder, then a call from the younger sister which reveals that she still has the happy scene in her mind. The happy scene is real, and thus the first moment she sees the fallen girl it will only be a picture. We know that she will have to reverse these realities into a tragic metaphor and suffer the effect.

Tolstoy has a similar example of such a previous reality recall in *War and Peace*. The young boy Petya is shot in the head just after offering an old Cossack some raisins.

"With trembling hands the old man turned over the bloodstained and mud-spattered face that was already turning white. 'I am fond of sweet things. They are capital raisins, take them all', came to his mind. And the other Cossacks looked round in surprise at the old man's face which was streaming with tears".

The above are tragic metaphors of the simplest type, but it is not for art to endlessly ape and reproduce such metaphors in the tragic language. Drama is the structuring of the tension between man's two ultimate attitudes to reality to be emotionally significant, and these attitudes change with time. Take for example the case of a man about to commit suicide by jumping off a skyscraper. Structured with a religious premise this is a tragic act, but take the religious premise away and it is shorn of the same tragic significance; he condemns not himself but man. Yet there are other attitudes to this act, and a new voice shouts up derisively "Go on jump you coward!"

Anti-Metaphor

One of the best ways to stop the aping of traditional moulds of evoking emotion is the anti-metaphor. Here is an example from the end of Truffault's film *The Soft Skin*. A wife who discovers that her husband has been deceiving her, determines to kill him. The husband, who has now reached the disillusionment stage of his affair, decides to phone her and come clean. On going to the phone booth in the restaurant where he is dining he finds it occupied by a young woman who is having an amusing conversation, and looks as if she will never stop. While the husband waits, cursing mildly, his wife is actually dragging out his shotgun for the final denouement. At last completely fed up, the husband returns to his table, where, not much later, his wife comes in and blows his brains out.

Between two units about to achieve a so-called tragic synthesis. Truffault has intruded a scene with comic overtones which destroys the metaphor. The final synthesis is played out with disturbing simplicity, and no new metaphor is attempted.

The only criticism I have to make of this sorely needed anti-metaphor is that I would like to see the different units, the husband's desire to phone, the girl's telephone conversation, and the wife's desire for vengeance to be shown in a spacially dynamic montage, rather than one after the other. For example, to have shown the telephone girl's happy face between the waiting husband's and his wife's, might have increased the anti-metaphor's compactness and internal tension.

Theatre and Cinema

Drama is more than art in motion. It is the structuring of emotional tension between man's two ultimate attitudes to reality through fear or laughter. We have said that the old structure of what is comic or tragic no longer always functions in every life. To create a new drama a profounder language is needed, and that language is cinema.

In Theatre, where reactions are usually between people, the collapse of the one attitude is but the automatic reinstatement of the other. From this viewpoint every human experience is nothing but a slight jolt from the ego dominance of a continuum towards egoless acceptance of the flux of continuums, or vice versa. The truth of any experience can be totally revealed by the utterances and behaviour of human actors on a stage.

If Cinema remains content with this level of presentation it will never be born. It must destroy this total landscape. The screen, and this is the point we consider extremely relevant to its future, can jolt its audiences into a greater variety of continuums and construct a greater variety of metaphors than any other art. But by merely showing the gain or loss of dominance in the move to and from the egoless reality in only ONE continuum (as with the example of Prince Andrei at Austerlitz), the job is only half done. To be dropped suddenly into other reality continuums in the process is far more profound, because for anyone to experience the awe-inspiring power of the Taoist reality, a sense of "changes of reality" is essential. The screen is well suited to do this.

To sum up then: Before Cinema can structure metaphors of any depth it must show the profound nature of the abyss in which men survive. To achieve this effect Cinema should first set out to destroy the dead metaphors which are its raw material. It can do this by jolting those who hold such units valid into different continuums, during which process (as with the example of Miliota in Pavese's novel), the original units are revealed to be no longer statements about reality and have to be abandoned. Only when a profound sense that things "are not quite all they seem" has been created can a metaphor of any depth be set up. Then two units, hostile and indifferent as they may have previously been, can clash; a new tension be set up, and a new emotional identity achieved.

III. "SANGRE DE DIOS": THE OUTLINE OF A FILM SCENARIO

Introduction

The film begins with a shot in the forest near Oaxaca. Between the immense pillars of the trees steals an old Indian woman. Every so often she crouches down and gathers something from the ground. On the screen flashes the title "Sangre de Dios" (God's Blood), and the narration begins: "God's Blood is the name given to the hallucinatory mushrooms of the Mazateca Indians. These mushrooms are gathered in the high humid rain forests of Mexico to become the flesh and blood of a religion as old and as strange as history itself.

These innocent looking mushrooms grow to full maturity in the space of one night. They are eaten in their natural state and produce hallucinations which many claim have taken them to the other side of existence".

The screen erupts in colour showing the blazing murals of Orozoco and Diego Rivera. Meanwhile the profound and masterful themes of the Mexican slow dance, the Abolango, rises in slow waves to a climax, in deliberate contrast to the violence and tension of the murals.

From the gaping mouth of Popocatepetl the camera sweeps over a dawn-lit countryside just beginning to shake off its sleep. The narration continues: "This film is a case history of three people who took the mushrooms. From their experience arises a blueprint of the human mind as it slowly disintegrates and then puts itself together again".

OUTLINE OF THE FILM

The film operates in various realities. The reality it begins in might be termed naturalistic.

The Natural Reality

The tone values are clear but not sharp. The people making the trip up the mountains must be entirely realistic, their personalities down to earth, their conversation ribald, and the scenic beauty provoking.

The naturalistic photography is used during the experience at its lowest levels. Certain grotesque movements are more provoking in this prosaic style than in any other. For example, Shirley Clarke's version of Jack Gelber's "The Connection" ("heroin addicts") was filmed entirely at this level, with the intrusion of the camera as a natural element to heighten the drama's reality. At one point a Negro deposits his cup of coffee on the floor and remains poised above it for a good five minutes, hardly aware that he is still there. Then, ever so slowly, he stretches himself and sits down. Such shots, and shots of hysteria or emotional changes from laughter to fear, will be filmed in a naturalistic way for the early stages of the film.

However, this camera style should be used in the very beginning mainly to create a happy atmosphere. Jokes about high school and high tea, set the participants tucking napkins in their shirt fronts as they prepare to eat the mushrooms. After they have taken the mushrooms and nothing happens, their suspended animation has a touch of the absurd about it.

When things begin happening, the naturalistic technique is abandoned because people staggering around a room being sick are hardly dramatic enough to provoke profound fear.

The naturalistic level of the story will be filmed in black and white, the hallucinations in black and colour. The only time true daylight colour should be used is in the highest moments just before the climax. In one of these moments, a participant becomes happy and laughs. His laughter should erupt over his face in natural colour, travel across the screen in waves, and then die away. The letdown and dullness of the return to black and white can be reinforced by music in the following way. When the participants realize their laughter is meaningless, and begin to misunderstand human emotions, the musical background should lose its vibrato; that is the basic tremolo and warmth inherent in all living sounds. In the moments of complete isolation musique concrete should be used.

Symbolic Realities

The trip up the mountain.

The symbolic implications of the trip up the mountain can be reinforced in dialogue and by certain visual images, such as the raging mouth of the volcano as opposed to the safety of the circular rim. The finest comparison of the mushroom experience lies in this image of a mountaineering expedition. The whole experience is concerned not with social realities, but with basic reality, its geography and density. Thus holding hands in the worst moments is not a sexual gesture; it is no more than a desperate attempt to maintain a link while negotiating some precarious ledge where few men have ever been. It is no more than the rope which binds mountain climbers together, which frequently saves members from falling into the void, but which is occasionally responsible for having them all dragged to their deaths.

The Taoist experience can be symbolically represented as rising above the clouds and for the first time being able to see the vast and peaceful domain below; but only from the rim of the volcano can the climber see it all, and only from there can he also gaze into the bowels of the earth and see the flaming chaos out of which it is composed.

Mental Realities

The drama can be heightened immensely by projecting various hallucinatory states onto the screen. Examples which show the more general nature of the experience, such as the savage's return to the tribal cave, can be used. Many of these sequences need careful composition, and much of the work would have to be done on an optical printer.

Distorted Realities

These, unlike the hallucinatory sequences, are not purely mental creations, but are created by the mind operating on images received by the retina.

The first of these is the apparent expansion of the room. This is a matter for the set designer, and need not be discussed here. The next is the displacement of parts of the body, facial distortions, and distortions of form in general. This again is work for the optical printer.

There are other distortions which require more advanced techniques, such as those dealt with in Appendix A. There is the displacement of sound from its source first hinted at in the hallucinations with the sea birds. There is spacial displacement first experienced in the expanding room and later in screams which can be shown to rip walls apart — revealing strange hallucinatory other worlds behind them, as in Louis Malle's *Zazie*. And last of all is the total disorientation of the senses, such that noises assume visual forms, and violent colours the impact of physical blows. Beyond this point I doubt if the film can go.

Conclusion

The film rises steadily to a state of turgid and apocalyptic disassociation. The let down, the slow return to normalcy, would be a cinematic anticlimax. The best conclusion would be to have one of the participants make a violent break from the room and plunge to his death. The film then returns to the prosaic grey tones of reality, but it is a reality which has changed.

APPENDIX A

Raymond Spottiswoode: *Creating Spacial Distortions on Film for Psychological Effects*

By starting with two space dimensions and one time dimension, and by stereo synthesis creating a third space of dimension, the remarkable effect of objects moving through solid space from infinity to the observer's eye without changing in size can be produced, thus contradicting the laws of normal space. Since this device introduces the time dimension, it may be filmed directly, without recourse to animation.

Carrying the stereomobile a dimension further, stereosculptures start with three actual space dimensions and one time dimension, which is of course not observable as such by the human eye. Instead, as preliminary experiments have shown, this stepping up of the solid form by another dimension results in a modulation of that form, a kind of optical variability of a solid of fixed volume and shape. In this way sculpture can be made to breathe with the palpitation of life itself, yet with a bending and undulating movement which no living thing could compass, and which would be hard to achieve by any kind of physical animation. And all this can be accomplished by a mere rotation of the stereosculptures, which may be filmed directly.

It is worthwhile repeating that stereographic art in motion is not animated sculpture; it creates effects unknown to the artist working in three real dimensions.

For instance, it dispenses with the force of gravity. Heavy objects, in all their solidity, may be made to balance in impossible positions, or float away and hang in space. Objects may be made to attain a vastness beyond all human construction. A man's figure can stretch from here to the horizon, a building overtop the Empire State; and the spectator, once accustomed to the stereoscopic world, will accept these things as being as real as life, for all his space perceptions will be satisfied.

Equally remarkable effects may be achieved with tone value and colour. The use of these by Renaissance painters to build up a world of plastic solidity was an enormous release of the powers of expression; so too was the freeing by the artists and others in this century of tone value and colour from their earlier associations, but this freedom was only gained at the expense of the depth and space sensations which had come to be thought inseparable from painting. Stereographics for the first time combines the Renaissance sense of space with the modern freedom of tone value and colour, for it enables space to be constructed at will without resort to chiaroscuro, which may then be introduced for quite different and even conflicting purposes.

Again, there are various devices like linear perspective and inferred opacity (one object partially blocking the view of another, which is thus assumed to be further away), which are generally used to reinforce one another to produce an impression of depth. In fact if, as in some modern painting, these two factors are set against one another or both are dropped, the depth sensation becomes ambiguous and confused. However, in stereographics the structure of space can be built without regard to linear perspective or inferred opacity, so that an object may seem to be near and far at the same time. Thus in the stereomobile, it is possible to have an object partially blocked out by another, and yet be advancing towards the eye while the "nearer" object retreats into the far distance. In the example quoted above in describing the stereomobile, the object can be seen advancing through space, and yet, since it remains the same size, it also appears to be standing still. Furthermore, linear perspective can be pitted against stereographic depth, setting up a counterpoint between different elements in the image.

Moreover the depth sensation itself may be made to vary in the time dimension. Far more easily than in the stereoscopic shooting of real objects can a stereoscopic variation be imposed on the drawings which, let us say, gradually reduces the feeling of depth and then increases it in the opposite direction, i.e. pseudoscopically, so that the world of vision is turned inside out. It had been discovered by experiment that if colour and tone values are applied with slight differences between the left and right hand images, strange luminous and iridescent effects may be attained within the area of painting.

Enough has perhaps been said to show that stereographics can create new fields of visual experience of extraordinary richness and variety. It can combine the discoveries of the Renaissance with the revolution of twentieth century painting, by accepting that revolution and restoring what it has largely sacrificed, the feeling of depth and space which Michelangelo and Tiepolo created in their soaring angel forms, and which Spengler has shown to be the gift to civilization of the gothic mind.

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SCIENCE, TECHNOLOGY AND THE HUMANITIES

Within the more representative educational systems of today we consciously and actively discriminate between three streams: those of science, technology, and of the humanities. We consider them as almost unrelated fields of study and prescribe different requirements for prospective entrants into the corresponding cultures. By our curricular prescriptions we effect a division between them which is carried out into later life by the traditional graduates. Yet we must agree that they possess a common and unifying element; the fields are studied by men, the cultures are human cultures. I wish here to explore some of their interplay.

Study of diverse and separated fields of human interests is more popular than study of the unitary aspects. In fact we may say that much of our intellectual effort encourages such separation: by studying fields separately and assigning to them diverse names we effectively hypothesize the reality of the separation, and consequently select data and areas for study in accord with this hypothesis. In turn the students of each separated fraction select material in conformity with their approach and, tend to diverge in their interests, develop their own language and jargon, and eventually become almost incapable of meaningful communication with one another. Such an artificial cultural separation virtually puts blinders on the eyes of investigators who so delimit their fields of interest that any overlap, distressing to some, is eliminated.

We cannot live fully in this artificially divided universe without a measure of discourse (i.e. undistorted communication). In fact we are beginning to appreciate that the lack of discourse is jeopardizing our survival potential both physical and intellectual.

Current divisions within our society have been brought into consideration by others — the most popular or best known exposition is that of C. P. Snow in his "Two Cultures". Snow's dichotomy is, I believe, too much of an oversimplification and for that matter so does he. Confining himself to the gulf between scientists and non-scientists or literati, he is unable to treat adequately pertinent economic influences which affect scientists and technologists in different ways. To increase the fit of the model with reality, I shall treat technology as a third culture closely related to the demands of the market-place.

I shall refer to science, technology and the humanities as if they are personified. This is, of course, only for convenience. There are only scientists, technologists, and — to use an obsolete word so as to avoid the misleading, humanist — humanitians. Science, technology and the humanities are their creations, and being the creations of man are responsive to the environment in which man finds himself: an environment which changes in time — I hesitate to say progresses — in the fields themselves which constitute part of the environment. There is an interaction between science, technology and the humanities which takes place in an historical matrix whether or not those who concentrate their thought and action in any one field communicate readily or directly with those in another. It is the nature of this interaction that should be better understood if we are dedicated to the belief that misunderstanding and conflict arise from lack of understanding. It is indeed this interaction that points out the artificiality of arbitrary boundaries, if only by transcending them.

One may question my statement that science is a creation of man. There is a not uncommon belief that science unearths the eternal secrets of nature, reveals the laws which govern nature and, today at least, derives these from measurement and observation. It relates to a belief that scientific theory is essentially cumulative and progressive. This belief was a majority opinion of scientists in the nineteenth century. It is exemplified in the idea, frequently put forth that physics, at least, in that period was developed to the state that the basic laws were known; future physicists would have to confine their efforts to that type of minor refinement concerned with adding another decimal place to the accuracy of physical constants. It was only shortly after this pronouncement that the explosion of new knowledge, starting with the discovery or radioactivity and the mutability of some atoms, changed the face of physics. How could this have occurred if science, in this case physics, represented the eternal laws directly derived from measurements and observations, measurements and observations that were no different after the explosion than before although new and different ones had appeared? The key word here is "derived". The facts remained the same; the derived interpretations differed. The interpretations, however, are in fact the laws in vogue; and the interpretations and hence the laws are the product of men.

Scientists seek to fit the data of observation into a coherent, non-contradictory pattern. To be successful (i.e. adopted as a paradigm) the pattern must comprehend the vast majority of data; and it must be able to predict the results of further experiment and observation. But equally important the pattern must be acceptable to the scientist, and that which is acceptable is related to the contemporary environment. There have been periods in the history of science when the only acceptable patterns had to be expressed in tangible mechanical concepts; there have been others where animistic explanations or those referring to occult spirits described an acceptable pattern of behaviour. None of these is fully acceptable today. Acceptability appears to be more basic to the scientist than paradigmatic adoption. Einstein has pointed out the need to examine the actions of a scientist to ascertain his inner beliefs which may be at variance with his writings. There is much evidence to show that the scientist accepts that which conforms to his idea of scientific suitability, an idea which may not necessarily arise within the contemporary scientific culture.

Scientific exploration, physical and mental, is shaped by the overall environment as well as the scientific one. Creativity, the proposal of new scientific ideas for acceptance, does not always arise synergistically from within the scientific environment but can be frequently shown to have had non-scientific or non-technological stimuli. Renaissance Humanism fostered the re-examination of the classical world by Renaissance scientists, and the pervading atmosphere abetted their attacks on the Scholastics.

The history of science abounds with examples of cultural interaction. Perhaps the best known lie in astronomy. The twin ideas that perfection lay in the heavens, associated with the idea that the abode of Divinity was on high, and that perfect bodies moved perfectly, namely in circles with constant velocity, dominated positional astronomy for nearly 2000 years. The task of the ancient astronomer was to fit to this basic structure, derived from mystic philosophy and religion, the observed irregular motions of the sun and planets. Note the order of importance: fit the phenomena to the "true" pattern. The first acceptable system conforming to the precepts was formulated by Eudoxos and his followers in the fourth century B.C. When the pattern of Eudoxos was found inadequate for prediction, it was replaced by that associated with the name of Ptolemy in the second Century A.D. Observation was fitted to a pre-conceived framework. Are we really able to step outside such environmental frameworks, even today or tomorrow? This is indeed our question.

Simplicity — the meaning of which is also affected by the environment — has often been a criterion of acceptability as expressed in Occam's Razor. Copernicus in 1512 proposed a new pattern for the "world" in which the fixed centrally located earth of the earlier systems was replaced by a moving earth and a central sun. The system had very little to commend itself as a physical system except its simplicity. To accept it demanded the acceptance of what I have called elsewhere the "common nonsense" that the earth beneath our feet is spinning and rushing through space. The Copernican system was accepted only slowly and only after more evidence was accumulated, but it opened the way to further thought even when still heterodox. The stimulated thought, however, transcended the boundaries of science and encroached into the preserve — if there be one — of the humanities as is brought out by Alexander Koyre in an appropriately entitled book "From the Closed World to the Infinite Universe". Thomas Digges first saw that a Copernican System rendered more reasonable the possible extension of the stars throughout space; in the older systems they had been considered all to be at the same distance on a sphere, the firmament, which bounded the cosmos. Giordano Bruno following Nicolas of Cusa appreciated that there is no unique centre in an infinite cluster and that the idea that the earth or the sun occupied a unique position in the Universe because of Man or even Man's special relationship to God was not a necessary one with such an astronomical pattern. This idea had previously been explored as an hypothesis; Bruno attributed to it reality.

Bruno went on to pantheism for which he was eventually burned at the stake in 1600. The punishment is understandable, whether or not it be condoned, because it was the natural action of those who saw the position of Bruno as a destructive one to their own. A position which they believed was beyond question. Their response was an appreciation of the fundamental unity of human thought: my thesis here. Despite the attempt at the suppression of the idea, an idea inspired by science, it extended into all areas of thought and permeated the humanities. Speculations on an infinity of worlds, of the problems of man in other sets of environments than our own permitted new and extended exploration in the humanities. Science-fiction is older than you may think.

It may be said that I am not discussing a phenomenon that could re-occur today; that such a situation arose only because it was a part of the break-up of the great Christianized Aristotelian world synthesis of the Scholastics. Certainly it is a prime and unique example, but the processes involved are not unique. They can be seen associated every great synthesis. Analogous interactions can be traced in the aftermath of Newton, of Darwin, of Heisenberg, and of Einstein, who introduced a boundless, but infinite universe.

There is a somewhat popular conception, adhered to by some scientists, by many science students, but mainly by scientific illiterates, that that which distinguishes science is that it is true. For these, there is but one "true" scientific explanation of a phenomenon. Such persons hold that the developing scientific method is one that eliminates outside influences and thus builds a completely objective structure. This may be a goal, but is it one that can be achieved? In this context one cannot mean truth in the Platonic sense of an Eternal Idea. This may apply for mathematics, Plato's own example, but it does not apply elsewhere in our environment. Sir Edmund Whittaker has stated that Science proceeds by successive approximations; Einstein has pointed out that the mathematical structure which we use cannot be shown as identical with the structure of the physical world. If we are to apply the word truth to science we must re-define it. We shall consider the common, pragmatic definition: truth is verifiability, and to avoid the mathematical and philosophical traps in this phrase, continue by defining verifiability as that which is sufficiently satisfying to lead the scientist to act as he would if it were true in the eternal sense. But with this definition, we have de-objectified science by demonstrating the central position of the scientist, a product of his environment, and thus intellectually as well as materially affected by it.

In no way do I intend to weaken the authority of science. Using my new definition of truth — which I repeat is the pragmatic common one — we see that science is true, has always been true, and, unless it radically changes its nature, will always be true. The vast bulk of scientific theory has always agreed with the facts, and the few discrepancies have served as a basis for extension of the current accepted pattern or paradigm.

We have seen how the astronomers of antiquity based their system upon a pre-conceived philosophy, which serves to exemplify a humanistic influence upon science. Thus Eudoxos, Ptolemy, and Copernicus all constructed their astronomical system on the basis of assumed uniform circular motion in the heavens. The superficial appearances were otherwise, but the proposed systems "saved the phenomena" in Plato's words by ingenious mathematical devices. The phenomena — i.e. the apparent motions of the planets — were first observed with the naked eye, but only reached an accuracy worthy of systematization with the extension of the senses through the use of instrumentation. In Egypt and in ancient Babylon a set of instruments was simultaneously devised which, in the course of improvement, gave increasingly accurate measurements. Instrumentation, however, is the direct product of current technology, which can now be seen, in turn, to affect the course of science. While the first instruments may have been crude — devices as simple as straight sticks, the polos and the gnomon — and the measuring systems crude — although not in angular measure; we still use the Babylonian division of the circle into degrees, minutes, and seconds — the subsequent ones were not. Technology is directed to satisfying human wants, some of which may have arisen because of the existence of a possible technology, but in this case one of the more important wants was the desire of man to know his future through astrology. A second was to be able more accurately to predict the dates of such festivals as Easter in order more properly to satisfy his religious obligations. A third was to be able to survey more accurately and felicitously and to navigate with better certainty. We may see the entry of the market-place if we recollect the necessity of surveying to re-establish property lines after the annual Nile floods.

In order better to accomplish these ends a series of highly developed instruments was devised by the time of the Renaissance to measure the positions of the stars. These instruments possessed accurately graduated scales, which were the product of fine workmanship developed to satisfy the artistic demands of the people and the technical needs of the horologists, clockmakers and surveyors. By the time of Tycho Brahe in the late sixteenth century, astronomical instruments were not only elaborate, but were works of art in their own right. With these instruments Tycho devoted his life to the recording of accurate observations of the planets. He died before being able to compare his observations with theory: this was carried out by his assistant, Johann Kepler.

The more precise the observations, the more stringent a test they afford a theory. Tycho's observations were such that it was impossible to conform to them by any theory of uniform circular planetary motion without the introduction of inacceptable complication. After almost inconceivable effort, Kepler turned to other methods of description. Imbued with a Pythogorean mystic belief that the key to nature lay in some form of mathematics, Kepler examined other motions than those compounded from circles, and eventually obtained a satisfying one in the assumption of elliptical orbits. When, some half-century later, Newton found that such orbits were a logical consequence of his Laws of Motion and of Universal Gravitation, he ushered in a period of thought as revolutionary to man's exploration of his significance and his position in nature as it was to the scientists' approach to the pattern of nature. The thread of interaction led from technology to science to the humanities. And Pope was not alone in extolling Newton.

Newton's synthesis set new criteria for satisfactory or acceptable explanations in science. The Newtonian celestial mechanics was initially unable to prove by its methodology that the Solar System would remain stable throughout extended periods of times. For the theory to be acceptable to Newton, at least, this was a necessity. Newton, himself, imagined that God intervened directly as required. When, over a century after Newton, the Marquis Pierre Simon de Laplace by improved mathematical methods proved the long-term stability of the system, it was possible for him to remove God from his consideration and state to Napoleon that there was no need for this hypothesis. God an hypothesis! What a change in thought! So much was the confidence of Laplace and numerous others in the mechanical interpretation of the universe that could be derived from the scientific work of Newton — one cannot omit mentioning Descartes as well — that they could discard that which had been the greatest certainty of man in ages past.

With the scientific backing of Newton a cold deterministic world based on mass, motion, and force could be considered adequate to explain our environment; the world of qualities and warmth and colour could either be considered as appearance alone, as irrelevant, or as something which could be neglected. An extreme position of materialism became acceptable to some. The physician and philosopher Julian de Lamettrie subsequently extended the scope of mechanism not only to include man within the mechanical system — this had also been done earlier by others — but to include a full system of morals and ethics. He stated, using some of the authority of science as backing, that atheism is the only means of ensuring the happiness of the world, which has been rendered impossible by the wars brought about by theologians. We may decry the extreme position here, we may point out irrelevancies in the argument, but we cannot brush aside the fact that de Lamettrie is one of the few "scientists" mentioned by Mao Tse Tsung. The thread is traceable from philosophy and technology through science and back to political philosophy.

Newton's system was a limited one, in which he attempted to base his conclusions on observational evidence alone. From observation and experiment he obtained by induction a set of mathematical principles from which he subsequently deduced further phenomena. He attempted to include within the pattern only that which can be observed: the remainder was to remain outside the pattern, outside the scope of natural philosophy (i.e. science). This limitation has never been acceptable for an indefinite time. It is not only apparently psychologically unsatisfactory to the scientists; it is stifling to creativity. Speculation beyond the accepted pattern becomes the practice: it was even indulged in by Newton who, however, distinguished between his speculation and a scientific agreement with observation. The Queries, which Newton placed in his Opticks are so identified. Newton's followers were not so meticulous but imbued the speculations with the Master's authority. The speculative world of atom-like corpuscles which was thus supported could be used as a basis for materialistic systems both scientific and philosophical.

I may have devoted too much time to materialism or to speculative systems derived from scientific ones. The purpose for bringing up the subject at all was to show a relationship between sciences and the humanities. It is far more than an intellectually trivial speculative extension, even one with non-trivial consequences. There is the inspiration of intellectually significant controversy which finds its way into all humanistic endeavours. There are new ideas, new interpretations of morals and ethics, new explorations of man's position in the universe and his relationships with society. To these new positions there are reactions; the unacceptable positions are refuted by arguments far outside the sphere of scientific discourse. One need only look at eighteenth century literature to see the effect of a new, cold, world-view; a view supported by some, mocked and satirized by others, and refuted in romantic reaction. Extensions into social and political theory are equally evident.

I do not wish to appear to be centering all intellectual activity on science. On the contrary I wish to put forth that there is no selected central point for the origin of ideas and that there has always been a mobility of ideas and hence an interaction. Literature was not the only field to evidence a reaction to materialistic mechanism; an opposing scientific school which did not consider a world of matter and force alone as sufficiently satisfying remained apart from the Newtonians. In turn its influence became felt in physics as well as in biology and philosophy wherein its major strength lay. The existence of dissenters to materialistic mechanism can be used here to point out a group which received stimulus and support from humanistic sources. For it was from these sources that the dissatisfaction arose.

The role of technology has not yet been adequately examined as an interacting force. One considers the technologist as catering to human wants. In the overcharged words of some, he is seeking control of nature. This is no time to explore the social and economic forces which influence the development of technologies; it is enough that their influence is recognized. A common distinction between scientists and technologists has been made by describing the scientist as one interested in understanding nature — in the words I have used here he is attempting to extend a coherent pattern — and the technologist as one interested in innovating to satisfy wants — although we not infrequently see the want arising after the innovation. This is a lovely distinction, which fails as often as it works. Were we able to read the minds of the scientists and technologists we might be able to classify in accord with this distinction, but I suspect that we would often need to change the classification of an investigator as he proceeds in his research. The distinction between science and technology is a useful one, but it cannot be made in intention, but rather in subsequent effect. In method of procedure the two are inextricably intertwined, and it is in the selection of procedures and the interpretation of results that they are subject to external as well as internal influences.

Science and technology may overlap in times of history, and they certainly overlap today; they are not the same. However, there is a similarity in the innovative or creative process of both. The ideas for the creative or theoretical structures may arise from the total environment and not only within closed systems neatly labelled: science, technology, and the humanities.

Primacy may not be placed in any of the three fields; all links in a chain are of equal importance. Long before what we might recognize today as science was evolved, there were well developed technologies which could satisfy, for a few, almost as many material wants as could be satisfied 100 years ago. Concurrent with their development appeared a social organization and structure which freed a part of the population to develop further technologies and others to speculate on nature and natural philosophy. We mark throughout history the continuous interplay of technology and society. We see what we call the humanities dwelling on the human problems of adjustment in the social environment, and we have also seen the stimuli given by scientific thought as it appears in literature and poetry. We have seen how technologists try to meet human wants in providing more precise instrumentation; our example was astronomy. This is the same process as that which provided levers or rather pincers to remove hot metal from a forge, bellows to heat the fire, magnificent metal cups both for use as containers and to satisfy artistic wants. There appears to be a relation between the art of an era and its technology to say nothing of the creations of technology (and in this case science as well) such as the cinema, radio, and TV. Such relationships are not new; one of the first appearances of a windlass was to lower the *deus ex machina* in the Greek theatre.

I could go on to the relationship of technology to war and the resulting effects on society and on the humanities: inspiration and devastation. Besides the obvious are the less apparent — Lynn White has made a strong case in tracing the feudal system as a consequence of the introduction of the stirrup. One can well follow into the realms of economic history. Marshall McLuhan has elaborated on the effect of printing on our whole mode of thought, and is studying the effects of the introduction of other media. Others have related the introduction of clocks to the orderly life. Even if not fully understood these connections are recognized. They are being studied by specialists and represent the most successful efforts to demonstrate the effect of technology on society. The inverse effect is less well brought out as are the interactions with science.

I have cast my examples in the framework of an historical matrix. The emphasis is on *becoming* not *being*; the interactions relate to the constancy in change recognized by Heraclitus not the Platonic Ideas. There has been only one, if any, *creation ex nihilo* in which we are interested. The content of change since that time is different, but we must act as if the process of change or interaction is the same. To what extent do we structure the ideas of the formative minds about to enter society? Do we prepare them to examine a proper pattern of interaction? Or do we encourage a cultural trichotomy? Let us first examine our instruction in science.

At any one state of science we have been able to build up a logical description which proceeds from the current simple bases to the most complex of current investigation. It presents current science logically and clearly, but with no indication of its method of evolution. This type of presentation has become the accepted method of entry to science or more properly to one of the sciences. It is the most rapid way to develop new scientists, although other methods have been considered. Those who have passed through this system have shown themselves capable of becoming scientists who can extend the content of the pattern of scientific knowledge. They may be good scientists, for the science of today, but are they properly prepared for tomorrow? The structure of science, the nature of the pattern, changes in a manner far removed from a logical development recognized in retrospect. The developing pattern is influenced from without as well as from within; a fact ignored by the logical approach. There is no real doubt that, if we do have time, the requisite changes in science will take place, they always have. However, if our goal in education is to increase the rate of progress should we not devote some conscious effort to studying its nature? Moreover, should we not endeavour to promote the unity of understanding that would follow?

I have purposely considered the culture of the technologist apart from that of the scientist. In the same way that the science of any era is always true, so is the technology of any era modern. Closer to the desires of the people than the pure scientist, technologists and engineers are looking towards the planning of change. The engineer has, moreover, emerged from his "cook-book" stage and is becoming culturally less introspective. Yet here, too, we often impose strictures in the educational curricula.

And the humanitian? Can we or should we wait for the intellectual aspect of the scientific pattern to filter through slow filters which often distort as has been current procedure? Can we or should we wait to see the effects of technology and engineering only in retrospect? Should we not be able to look at the future with a total appreciation of our intellectual and material environment? I shall reject the excuses that the content of science and technology is too great and that the interests and abilities of the humanitian are so different from those of the other cultures that his goal is not attainable. To study the nature of change in its historical matrix and to appreciate the current structures are not too onerous. As for interest, are not the humanities concerned with all man's emotions, aspirations and intellectual accomplishments?

In construction, the engineer often must first build an auxiliary, to protect and support the final project, a so-called false-structure, such as a coffer-dam, eventually to be disassembled when the work reaches an appropriate state of development. Let us recognize our curricular division as such, useful maybe even essential, but let us not mistake them for the edifice itself. Let us not conceal the unifying aspects of our intellectual adventures into science, technology and the humanities.

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